CLAIMS

What is claimed is:

1. A method of coupling one or more surface-emitting lasers to one or more edge-receiving optical devices, the method comprising the steps of:

mounting the one or more surface-emitting lasers to an optical bench substrate;

mounting the one or more edge-receiving optical devices to the optical bench substrate; and

emitting output signals from the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

2. The method of claim 1, wherein the one or more surface-emitting lasers are fabricated on a laser substrate; and wherein the step of mounting the one or more surface-emitting lasers comprises the step of mounting the laser substrate to a slot on the optical bench substrate so that the output signals emit directly into the one or more edge-receiving optical devices.

3. The method of claim 2, wherein the step of mounting the laser substrate comprises the step of mounting an edge of the laser substrate to the slot so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

4. The method of claim 1, wherein the optical bench substrate defines one or more alignment features for aligning the laser substrate and the one or more edge-receiving optical devices together so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

5. The method of claim 2, wherein the slot is photolithographically fabricated in the optical bench substrate.

6. The method of claim 2, wherein the slot is fabricated in the optical bench substrate using electron beam lithography.

7. The method of claim 4, wherein the alignment features are photolithographically fabricated in the optical bench substrate.

8. The method of claim 4, wherein the alignment features are fabricated in the optical bench substrate using electron beam lithography.

9. The method of claim 2, wherein the step of mounting the laser substrate comprises the step of mounting the laser substrate to the slot on the optical bench substrate by one of solder and epoxy.

10. The method of claim 1, wherein the step of mounting the one or more edge-receiving optical devices comprises the step of mounting the one or more edge-receiving optical devices on the optical bench substrate by one of solder and epoxy.

11. The method of claim 1, wherein the step of mounting the one or more edge-receiving optical devices comprises the step of monolithically fabricating the one or more edge-receiving optical devices on the optical bench substrate.

12. The method of claim 1, wherein the one or more surface-emitting lasers comprise an array of lasers and the one or more edge-receiving optical devices comprise an array of edge-receiving optical devices.

13. The method of claim 1, wherein the one or more edge-receiving optical devices comprise one or more edge-receiving optical modulators.

14. The method of claim 1, wherein the one or more edge-receiving optical devices comprise one or more edge-receiving optical amplifiers.

15. The method of claim 13, wherein the one or more edge-receiving optical devices further comprise one or more edge-receiving optical amplifiers positioned in the path of the output signals from the one or more edge-receiving optical modulators.

16. The method of claim 14, wherein the one or more edge-receiving optical devices further comprise one or more edge-receiving optical modulators positioned in the path of the one or more output signals from the one or more edge-receiving optical amplifiers.

17. The method of claim 1, wherein the one or more edge-receiving optical devices are semiconductor optical amplifiers (SOAs).

18. The method of claim 1, wherein the one or more edge-receiving optical devices are optical waveguides.

19. The method of claim 1, wherein the one or more surface-emitting lasers are vertical-cavity surface-emitting lasers (VCSELs).

20. The method of claim 1, wherein the optical bench substrate further comprises, for each edge-receiving optical device, a driver circuit coupled to the edge-receiving optical device.

21. The method of claim 1, wherein the optical bench substrate is a silicon optical bench.

22. A method of conditioning the output signals of one or more surface-emitting lasers, the method comprising the steps of:

mounting the one or more surface-emitting lasers to an optical bench substrate having one or more edge-receiving optical devices so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices; and

coupling the output signals to the one or more edge-receiving optical devices.

23. The method of claim 22, wherein the one or more surface-emitting lasers are fabricated on a laser substrate; and wherein the step of mounting the one or more surface-emitting lasers comprises the step of mounting the laser substrate to a slot on the optical bench substrate so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

24. The method of claim 23, wherein the step of mounting the laser substrate comprises the step of mounting an edge of the laser substrate to the slot so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

25. The method of claim 22, wherein the step of mounting the one or more surface-emitting lasers comprises the step of mounting the one or more surface-emitting lasers to the optical bench substrate by one of solder and epoxy.

26. The method of claim 22, wherein the optical bench substrate defines one or more alignment features for aligning the laser substrate and the one or more edge-receiving optical devices together so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

27. The method of claim 22, wherein the one or more edge-receiving optical devices are monolithically fabricated on the optical bench substrate.

28. The method of claim 22, wherein the one or more edge-receiving optical devices comprise one or more edge-receiving optical modulators.

29. The method of claim 22, wherein the one or more edge-receiving optical devices comprise one or more edge-receiving optical amplifiers.

30. The method of claim 28, wherein the one or more edge-receiving optical devices further comprise one or more edge-receiving optical amplifiers positioned in the path of the output signals from the one or more edge-receiving optical modulators.

31. The method of claim 29, wherein the one or more edge-receiving optical devices further comprise one or more edge-receiving optical modulators positioned in the path of the output signals from the one or more edge-receiving optical amplifiers.

32. A method of assembling a surface-emitting laser system comprising the steps of:

fabricating an array of surface-emitting lasers in a laser substrate;

providing an optical bench substrate having an array of edge-receiving optical devices; and

mounting the laser substrate on the optical bench substrate so as to optically couple the array of surface-emitting lasers to the array of edge-receiving optical devices.

33. The method of claim 32, wherein the step of providing an optical bench substrate comprises the step of fabricating a slot for receiving an edge of laser substrate.

34. The method of claim 33, wherein the step of providing an optical bench substrate further comprises fabricating alignment features for aligning the laser substrate and the array of edge-receiving optical devices together so as to optically couple the array of surface-emitting lasers to the array of edge-receiving optical devices.

35. A system for conditioning the output signals of one or more surface-emitting lasers, the system comprising:

an optical bench substrate;

the one or more surface-emitting lasers being mounted on the optical bench substrate; and

one or more edge-receiving optical devices positioned on the optical bench substrate so as to receive the output signals from the one or more surface-emitting lasers.

36. The system of claim 35, wherein the one or more surface-emitting lasers are fabricated in a laser substrate, and wherein the optical bench substrate photolithographically defines a slot for receiving an edge of the laser substrate so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

37. The system of claim 36, wherein the optical bench substrate further photolithographically defines alignment features for aligning the laser substrate and the one or more edge-receiving optical devices together so as to optically couple the one or more surface-emitting lasers to the one or more edge-receiving optical devices.

38. The system of claim 36, wherein the slot is fabricated in the optical bench substrate by electron beam lithography.

39. The system of claim 36, wherein the alignment features are fabricated in the optical bench substrate by electron beam lithography.

40. The system of claim 35, wherein the one or more edge-receiving optical devices are monolithically fabricated on the optical bench substrate.

41. The system of claim 35, wherein the optical bench substrate is a silicon optical bench.

42. The system of claim 35, wherein the system is for use in one of data communications and telecommunications.

43. The system of claim 35, wherein the system is further for measuring radiation absorption by a measurement species, the system further comprising:

one or more sources of single mode laser radiation comprising the one or more surface-emitting lasers, respectively; and

a detector for detecting the single mode laser radiation after passage thereof through a quantity of said measurement species.

44. The system of claim 43, wherein the laser radiation is infrared laser radiation.

45. The system of claim 43, wherein the measurement species is a gas disposed in a measurement cell.

46. The system of claim 43, wherein the measurement species is an unconfined gas.

47. The system of claim 43, wherein the measurement species is one or more of human blood, a bacterial species, and a viral species.